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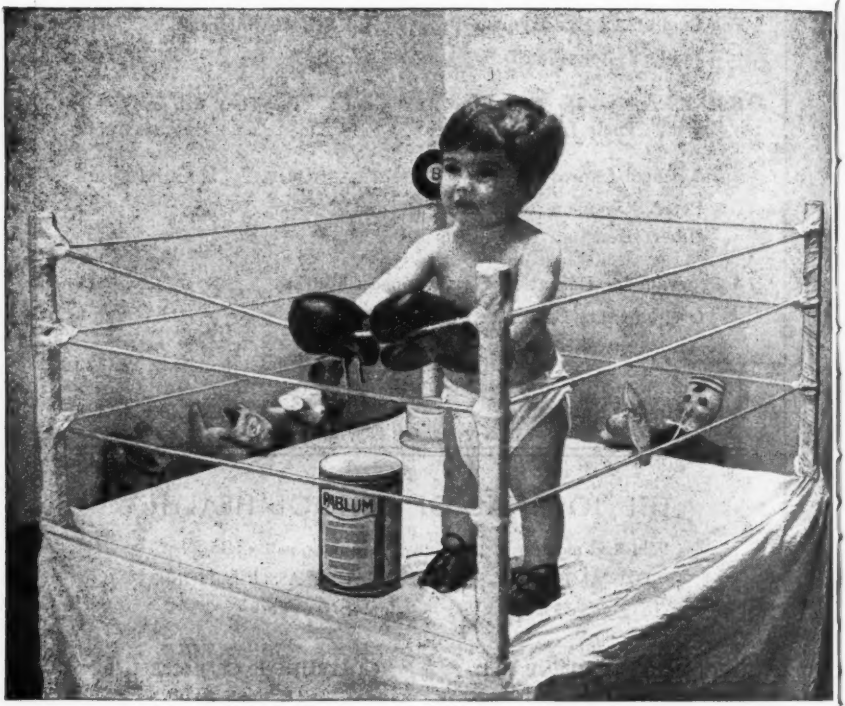
PABLUM

THE JOURNAL OF SCHOOL HEALTH

Devoted to the interests and advancement of school health service and instruction. Your participation by membership is solicited.

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THE GOAL OF AN EYE-HYGIENE PROGRAM FOR SCHOOL CHILDREN*

JAMES J. REGAN, M.D.†
Boston

The title of this paper implies that there should be some sort of program directed toward the maintenance of eye health in all schools. Such a program need not be expensive, requiring equipment, personnel and time, nor so extensive as to include a complete eye examination by a competent ophthalmologist, let us say three or four times during the child's school life. Its object is best expressed as a consciousness on the part of school administrators, teachers and pupils alike of the value of normal, comfortable vision to progress in health and education, coupled with a desire for positive action. It can take such form as facilities available in the locality permit and the support of the local school authorities provide. The program may range from tried and true yet simple procedures, such as annual medical inspection and tests of visual acuity for distance (the Snellen test), to the complete and periodic examination of each child by a competent ophthalmologist. It may be extended to include psychophysiologic studies of certain groups of children such as those presenting symptoms of reading disability—formerly referred to as congenital word blindness. It may include provision for instruction concerning the care of the eyes (personal hygiene) and accident prevention, and may stress the importance of paying more attention to the eyes during the routine medical inspection. It may furnish special educational facilities for the visually handicapped child. It may provide for better school buildings, artificial illumination, desks, printing of schoolbooks, as well as other printed and mimeographed material, window shades and wall paint. It may provide for good blackboards, properly located and cared for, to ensure maximum con-

*Presented at the annual meeting of the Massachusetts Medical Society, Boston, May 24, 1944. Reprinted from the New England Journal of Medicine, Oct. 5, 1944, p. 486.

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trast and a minimum of glare from reflected light, and proper chalk, and may even place minimum limits on the size of letters and figures to be written on the blackboards.

Such a program may be expanded or contracted from year to year, reflecting any new advances in the fields of education, psychology, ophthalmology, architecture and engineering, and would survive curtailment of the school budget. It would even permit, occasionally, trial of newer technics of unproved value, without being seriously or permanently affected.

The consciousness of the value of good vision, which is the cornerstone of the program, must be laid in teacher-training institutions. All elementary-grade and intermediate-grade teachers should have some knowledge of visual psychology, as well as of ophthalmologic anatomy, physiology and hygiene. They should be instructed in objective and subjective signs of eyestrain, and should be so well versed in a dependable vision-testing technic that their findings will be accurate. Because the teacher has the unique opportunity of observing the child at work every hour of the school day throughout the school year, any eye-hygiene program that does not include the teacher will fall far short of its goal. There is a mutual benefit to be derived. A child who sees well and comfortably is less of a drain on the teacher's time and patience than the child with poor vision.

Historically, it is true that teachers, rather than physicians, were responsible for the enactment of legislation in Massachusetts that, since 1906, has required that every child in the public schools have a vision and hearing test at the beginning of each school year, and that the class teacher conduct the tests. The prescribed vision test is one designed to measure the acuteness of distant vision, and nothing more. Admitting that it would be better to know more than is now known about the visual efficiency of school children, I am certain that it is wrong for any individual or group to challenge the value of the results of the Snellen test, provided that it is properly conducted. This test is simple and reliable, and involves no expense; it takes a minimum of school time; it requires no special equipment, eliminating such factors as cost, transportation, breakage and replacement; and it brings about the discovery of about 85 per cent of children with visual and other eye defects. It might, indeed, discover 10 per cent more, if it were supplemented by a simple test for detecting farsighted children, who have normal distant vision but find near work difficult. For these reasons, the value of such a test should be defended against attacks by groups, many of whom have equipment to sell and who, in order to impress school authorities with the superiority of their devices for discov-

ering rare and usually unsymptomatic conditions, such as extra-ocular muscle imbalance, suppression or alternate fixation, poor stereopsis and astigmatism, feel obliged to declare the Snellen test worthless and the school system that uses it archaic.

The test is absolutely dependable, but educational authorities seem to have little regard for the valuable information it furnishes, and consequently bother little about the manner in which it is conducted. The following examples of the misuse of the Snellen test in the public schools of Massachusetts since 1906 are illuminating:

Teachers, having to rely on an instruction sheet that is furnished with the chart to guide them, often failed to observe one or more fundamental requirements, such as making sure that the eye not being tested was covered, or that the chart was placed where illumination would be adequate, and without glare from reflected light.

Letter charts were used, which children committed to memory. The use of letters precluded the vision testing of kindergarten and first-grade and second-grade children, most of whom were, for the purposes of the test, illiterate.

The experience gained by school authorities during the first few years suggested the need of measuring the vision of younger children. They appealed to the State Department of Education, which in turn requested the Department of Public Health to recommend a test chart for illiterates. A subcommittee of the Council on Public Health, made up of Drs. David L. Edsall and William J. Gallivan, in 1915 recommended a chart for the use of teachers testing illiterates, which since 1917 has been distributed on request to the schools of the Commonwealth. This chart, which is based on the Snellen scale, was partly devised by Snellen himself[1] as a test for illiterates, using three parallel lines. Pergens[2] later joined these lines on one side by a line of equal width. This is the most practical test object for use in schools, and moreover its used should not be limited to illiterates. It has three outstanding features. Firstly, after a short drill, conducted as a game, the vision of children over two years of age may be accurately tested with it. Secondly, it is not to be compared with capital letters, which when made as uniform as possible are visible from different distances.[3] It therefore conforms more nearly than do other objects to the physiologic requirements for a test object. Finally, if the symbols are selected by the teacher conducting the test, as I[4] have recommended, even a small chart, such as that furnished by the State Department of Education becomes unlearnable.

A test chart that can accomplish so many things faithfully is no mean device. Competent ophthalmologists during the last quar-

ter of a century have filled many pages of printed matter with a variety of unique test symbols, all carefully drawn to the Snellen scale, but none of these, so far as I know, compare with the Pergens symbol. As for some ludicrous and impractical technics suggested to prevent school children from memorizing test letters, the least said of them the better.

In a previous paper, I[4] suggested a technic for testing vision of school children. It required two teachers to conduct it, because the occluder used was a card measuring 3 by 5 inches, and if the children were allowed to hold it and the better eye was occluded, most of them peeked. The technic has been modified by substituting the more efficient occluder used by the Medical Department of the United States Navy.

Technic of Testing

The chart should be hung on an easel, blackboard or other device near a window (but not in direct sunlight) and at right angles to it; it may be hung in the window casing. If one end of the room is brighter than the other, the chart should be placed at the brighter end. Its height should be about the level of the average child's head. If there is glare* from windows between the chart and the child, the lower half of the window may be covered or the shade drawn. This is rarely an obstacle unless the child, standing at the 20-foot line, is abreast of a window.

A distance of exactly 20 feet should be measured from the chart along the windowed wall, a thumbtack or chalk mark being placed on the floor or wall every 5 feet.

The occluder may be made of heavy cardboard, plastic or Masonite. The latter two materials are washable, even in antiseptics (a 1:1000 aqueous solution of Zephiran Chloride may be used). The occluder is held in the left hand with the opening in front of the right eye, which should always be tested first. If the child wears glasses, he should be asked whether his vision is better with or without them. If it is better with glasses, the test should be made with them on, a notation to that effect being made on the record. If the vision is better without glasses, the test is made with them off. The record will be more complete if the vision is tested both with and without glasses, in which case the vision of the naked eye is tested first. (If the vision is better without glasses, it should not be concluded that they are not correct; instead, re-examination should be advised, especially if the glasses are more than a year old.) After the right eye has been tested the child holds the

*Glare is a brightness within the field of vision of such excessive character as to cause discomfort or interfere with vision. (Occluder on p. 121.)

occluder in the right hand with the opening in front of the left eye, and that eye is tested.

When pointing to the symbols the examiner should not stand on the window side of the chart, lest a shadow be cast upon it. The point of a pencil should not be used, since it may mark the card. The pointer must not cover any part of the symbol. A symbol on the top row is selected, and the child is told to semaphore the direction in which the arms of the symbol point. If his direction is correct, a symbol is selected on the second row. If the child's answer is correct, one on the third row is chosen. If the direction is correct, at least two symbols on the fourth row are selected, one with its arms pointing up or down, and the other with its arms pointing to the left or right. One must glance at the child frequently to see that the occluder is kept in place, as well as to see that he semaphores correctly.

If the child reads two or more symbols on the fourth row, the vision is recorded as 20/20. If he reads only to the third row, it is recorded as 20/30; if only to the second row, as 20/40; and if only the top row, as 20/50. He should be made to read at least two symbols on the lowest row that he can see in order to get credit for the row. If he cannot see the top row, he should be told to approach the chart—always with one eye covered—and stop where he can see two symbols on the top row. If, for example, he walks to within 5 feet of the chart, the vision is recorded as 5/50.

Follow-Up

Obviously, much of the time spent by school physicians and nurses in inspecting children's eyes and by teachers in testing their vision would be wasted if some provision were not made *by the school* to follow up cases of defective vision and other eye conditions discovered or suspected, soon after a notice has been sent to the parent or guardian. Expert medical advice is available in normal times to school children of all economic groups in the large cities; in small towns and in rural communities, this presents a problem. The optometrist may be the only person available to provide eye care of any sort, but this service, even though limited in scope, may suffice for a large percentage of children with refractive errors, especially myopes. The more complicated cases should be brought to the nearest ophthalmologist or eye clinic by the parent, the school nurse or some other designated person. The disposition of indigent cases should be the concern of the school principal or physician.

To recapitulate, the cornerstone of a workable, effective eye-hygiene program for school children rests on the development of a

consciousness within the school system, especially among the teachers and pupils, of the value of normal vision to the progress of health and education. This may be developed through an educational program in the schools, sponsored by a joint committee of the State Department of Public Health and Department of Education. The committee's function should be to stimulate surveys by the school authorities in cities and towns throughout the Commonwealth. Interest might be created by first presenting to the heads of all school departments a copy of the statute requiring an annual vision test, together with an authoritative statement regarding the importance of conducting the tests properly, as well as obtaining relief for children early in the school year for those found defective.

With this accomplished, such a committee might arrange an outline for teachers, giving symptoms of eyestrain that may warrant a medical eye examination. Often a child with 20/20 vision in each eye suffers from sties, crusted red lids, watery eyes, irritated eyes or headache, especially after doing close work. Many of these children are farsighted, and if their accommodation is good, the Snellen test will not screen them out, but they suffer from and dislike close work, and are frequently truants. The committee might suggest a simple test for screening out this type of child at the time of the annual vision test, even though this is not required by law.*[5] Such children often require glasses for near work only, and may even leave them in school. It is of historical interest that Dr. Henry Willard Williams, first ophthalmic surgeon to the Boston City Hospital, presented a paper to the railroad surgeons of America in Chicago shortly after the Civil War in which he suggested this as a disqualifying test for railroad employees.

Such a committee could encourage the inclusion of some simple color-perception test, especially for junior-high-school pupils, who might be planning a career in art, aviation, the Navy or the textile industry. A few pieces of colored yarn or a half-dozen colored pencils would suffice to detect the color blind. The best approach to this group might be made through the Department of Vocational Guidance.

This work can progress to the study of regressive reading habits, heterophoria and stereopsis and to the gaining of other information that may be of importance in promoting normal educational progress. But before any of these are undertaken, the im-

*The simplest test for this purpose is one of a battery of tests known as the Massachusetts test, developed by Oak and Sloane.[5] It is accomplished by placing a pair of spectacles containing plus spheres (+1.50 or +2.00) before the eyes of a child who has 20/20 vision. If he can still read 20/20, his farsightedness may well cause symptoms, either ocular or systemic, and reference for an eye examination is advisable.

portant thing is to find out whether every school child has normal vision. With this work well done we shall be better qualified to evaluate properly the new lighting fixtures, optical aids and ophthalmic correctional devices so highly publicized. In this way a goal may be reached that is worthy of the best American medical and educational tradition.

I am indebted to Lieutenant Commander E. H. Daniels, (MC), U.S.N.R., for calling the most recent type of Navy occluder to my attention.

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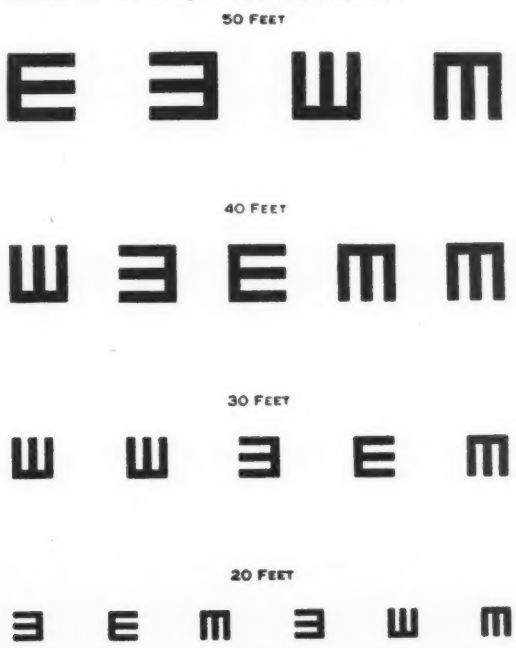


FIGURE 1.

This Boston Test Chart differs from other standard charts in that symbols on the 30 and 20 foot lines are spaced more than 5 minutes apart.

EYE EXERCISES—DO THEY DO ANY GOOD? DO THEY DO ANY HARM? THEIR LIMITATIONS*

WALTER B. LANCASTER, M.D.

It is not necessary to be a doctor to realize that exercises, practice, repetition, doing a thing over and over under competent supervision, are the universal means by which one learns, and are not limited to a few branches of learning. The child learns to write, to draw, to play a musical instrument, to play games, to wrestle, to fight, to sing. The surgeon makes use of exercises to cure defects and deformities: flat feet, crooked backs, weak muscles.

Dual Function of Exercises,—Exercises are used to develop skill and to increase muscular strength, sometimes both. But they are not limited to things requiring muscular activity—motor functions. The same principle applies to sensory functions. The young violinist has to learn to use the fingers of his left hand on the strings and to use his right hand and arm to manage the bow, but it is indispensable that he learn to tune the instrument and that he learn so to place his finger tips as to produce the correct pitch and that is a matter of training the ear, that is, hearing, and of co-ordinating fingers and ears. The tea taster has to learn by practice, has to train and develop his sense of taste and smell.

The student of art in learning to appreciate painting, has to train his eye, has to develop his ability to see. This is done by practice under competent teachers. The sailor has to learn to recognize different vessels and different airplanes. The hunter has to learn to see things in the woods.

One of the most fundamental laws of biology is that repetition of an act facilitates its performance. The first time one does something it may be done clumsily and laboriously, the hundredth or the thousandth time it may be done dexterously, and with ease.

If the act involves muscular action, as most acts do, one result of practice, repetition, exercise, is that the muscles involved increase in size and power (hypertrophy)—become stronger. For example, in learning to row, two things are involved, skill in handling the oars, and strong enough muscles to do the work required. If the muscles are already strong enough, no increase in strength results from the exercise—only increase in skill. In exercises at the piano, it is not stronger muscles that are the aim, but skill in using the muscles.

Thus, one can think of the muscles and the nerves and the

*Reprinted from the Sight Saving Review, Vol. XIV, No. 3, 1944, p. 139.

nerve centers in the brain and spinal cord as constituting a *neuro-muscular mechanism.* Sometimes the main thing is developing stronger muscles for a particular act but far more frequently it is the *neuro* part of the neuro-muscular mechanism that requires developing. We shall see how important that is in developing vision—ability to see, to use the eyes.

Seeing—Half Ocular, Half Mental,—Seeing can be analyzed into several parts. First, an image of the object looked at is formed on the retina. Second, the eyes must be moved so that the images on the two retinas fall on the most sensitive parts of the two retinas so that one can see the object most distinctly (*fixation,* often erroneously called focusing) and so that the image of one eye blends or fuses with that of the other eye (*binocular vision*). Third, the image must be focused so that it is sharp and well-defined, not blurry; this is done by the accommodation. The result is a sensation—two sensations in fact, one for each eye. This is the first step in seeing. But it is only the first step. Its importance is greatly overstressed. The reason its importance is over-emphasized is that defects in this part of the act of seeing can be helped by glasses. As a matter of fact, eye specialists devote most of their time to correcting certain common defects of this kind (myopia, hypermetropia, astigmatism, presbyopia, heterophoria). Hence it is not to be wondered at that they emphasize the importance of this part of the visual function—the ocular or physical part.

The Brain in Seeing,—The second and equally important step in seeing is this: the sensations must reach consciousness and become perceptions. It has been thoroughly established that it is impossible to experience a pure, isolated sensation. There are two factors which affect all sensations as they reach consciousness and become perceptions. In the first group are all those other sensations coming into consciousness at the same time not only through the visual apparatus but also through auditory, tactile, kinesthetic and all other avenues. The second group comprises memories of past experiences and even inherited predispositions. A mere glimpse, perhaps in a dim light, of an object well-known from previous experience results in "seeing" many details which as a matter of fact are supplied by memory, though quite unconsciously and automatically. A familiar figure is dimly seen at twilight walking with a child and a dog across the street. The woman is heard to call the dog and the familiar voice confirms the inadequate sight and details are supplied by memory; details which include the hat and dress of the woman and of the child, the color and coat of the dog, etc.

Consider the use of the eyes in reading. When a beginner

reads, words have to be looked at letter by letter until they have become familiar as whole units (some methods of teaching require the pupil to learn words as units and not spell them out letter by letter even at the beginning). A new language finds even the expert reader adopting the beginner's method of spelling out the unfamiliar words. Eventually, the expert reader does not even "see" or look at single words, let alone the individual letters of each word, but he scans the lines of words with several fixation pauses of 0.2 to 0.3 seconds duration, and with very rapid movement (0.02 to 0.03 seconds) from one fixation to the next. Because he comprehends what he is reading he needs to catch only a word here and there and *his mind supplies the rest.* And yet the expert proofreader will detect a misspelled word or error of punctuation or other defect because something about the word or words does not fit the mental picture (the memory picture) with which it is incessantly being compared.

Thus, learning to read involves among other things (such as acquiring a vocabulary of the language being read) chiefly storing up memories, mental pictures of words and phrases which a mere glance at the printed line suffices to recall. One may silently or even audibly form the words with his lips to aid the visual impression by the vocal and auditory memories of the same words.

Notice that from the factor of experience (memory) arises the ability to complete a pattern from incomplete data. Then there is the "rectifying capacity" by which an image of a ring held tilted at an angle so that it forms an elliptical image on the retina is perceived as a circle, not an ellipse; or a square card tilted so that its image on the retina is not square is nevertheless perceived as a square.

Determining Results of Eye Exercises,—Before taking up specific examples of the effect of eye exercises, there is one important question to be answered. How is one to determine the results? There are two ways. The commonest and most important measure of visual performance (of seeing) is the Snellen test. This consists of a chart with letters or other characters of different sizes arranged in rows. Each row is marked with a number which is the distance at which the letters in that row can be read by a person with standard normal vision. If feet are used, the lines are, for example, 10, 12, 15, 20, 30, 40, 60, 100; or if the metric system is used, the lines are 3 meters, 4, 5, 6, 8, 10, 12, 15, 20 and so on. The usual distance for testing is 6 meters. If the subject at 6 meters can read the line marked 5, his vision is 6/5, if he can read no more than the line marked 12, his vision = 6/12, etc. When proper precautions are observed, this gives a fairly dependable measure of the

ability to distinguish small objects called "visual acuity" (abbreviated as V.). It is not the sole method of measuring visual functions. There are other things to be considered besides visual acuity, such as color sense, binocular vision (often referred to as muscle testing) stereoscopic depth perception and others. It is not necessary to take these up in detail. *All these tests aim to measure in scientific standard units.*

There is another way to estimate the results and that is to ask the patient whether he sees better, uses his eyes more easily and with less discomfort, etc.

The two methods do not always agree. For example, some years ago a young ophthalmologist was sent to Europe to investigate the methods used by quacks and others in treating cataracts without operating. He returned to New York and proceeded to try out these methods on a hundred patients at the Clinic. After a year of careful following out of the treatment, the patients were asked if they had improved and nearly all said they had and wished to continue. But the ability to see had been carefully recorded at the beginning of the treatment, from time to time during the treatment, and at the end. The sad facts were that the vision was rather worse than at the beginning. The cataracts had continued to progress in spite of the treatment. The impression of the patient was a quite misleading guide to the actual result.

It will be enlightening to apply these methods to a few cases where eye exercises or eye-sight training have been used. In that way one can evaluate claims made by advocates of various methods of training or treatment by exercises.

Speed of Reading Improved by Exercises,—The speed with which a number of digits or letters are seen can be greatly improved by training and can be measured accurately. Renshaw reported work on the Polish lightning calculator, Dr. Finkelstein, who memorized: 8 digits in .003 seconds; 12 digits in .824 seconds; 16 digits in 1.73 seconds.

Renshaw then trained a dozen university students, two of whom were able, after practice, to surpass Finkelstein's record for speed in learning digit groups. He remarks: "The difference between the expert and the novice in the rapid and accurate perception of visual material is the same difference between the expert and the novice in the performance of any skillful act. We have to learn to see just as we have to learn to swim, to play the piano, or to speak French. This can be done with skill and efficiency or it can be done haltingly and ineffectively. When we train children to learn to spell English words by replacing the wasteful and ineffective disjunctive method of seeing words with the proper method of

visual perception, spelling difficulties disappear. Not only does a child spell accurately and easily, but he comes to enjoy spelling. An incidental by-product also is that his rate of reading and index of comprehension automatically show a corresponding improvement."

Color Blindness Erroneously Thought Impoved,—Treatment for color blindness in men rejected from military service has been advocated. Color blindness *can* be measured by accurate laboratory tests. It is *usually* measured in the military services by a test which is sufficiently accurate for most purposes but which can be circumvented by practice. In other words, a candidate though still color blind (it is a congenital incurable condition) can learn to pass the test. This test consists of a number of plates called pseudo-isochromatic, designed by Ishihara. The plates consist of a large number of small colored discs of many tints closely packed and apparently irregularly distributed over the page all mixed up. To a normally sighted person, the distribution is not haphazard but there is a large numeral easily distinguished because the tiny discs of which it is made differ in tint from the surrounding spots of color. To a color blind person, the figure is not visible because the spots of color of which it is made do not appear to his eyes sufficiently different from those surrounding it to make a contrast. The American Optical Company has published a set of plates, 46 in number, all different and cunningly disguised to catch and differentiate different types of color blindness. Even "normal sighted" people usually make a few mistakes with this test.

The usual treatment for color blindness in men rejected from military or other service is called the light and filter treatment. As described by optometrists it consists in the fixation of colored sources of light for several minutes, and the use of filters, with daily check of progress on the pseudo-isochromatic plates—the "Light and Filter" treatment.

Two instructors in optometry at Ohio State University Charles S. Bridgman, Opt.D., Ph.D., and Henry W. Hofstiter, Opt.D., Ph.D., skeptical about this method of improving color vision, tested several subjects, three of whom had passed the Navy tests successfully after treatments by a practicing optometrist. They concluded that their results did not in any way support the assumption that the *exercises* intended to train color vision are of any assistance. It appeared on the contrary that the exercises are merely time-consuming, that the improvement in scoring is related only to the *learning made possible by repeated testing*. The following is a sample of the results obtained. A color blind subject from the eye clinic, tested in the usual way, scored 15 correct out of 46

plates. He was tested four times. He was told when he was wrong but was not told the correct answer nor given any other instruction—simply retested again and again. His scores were 27, 35, 43 on the second, third and fourth tests. Similar results were shown by other subjects.

The authors further concluded that "those who criticized the practice of training color vision are entirely justified." They "find no evidence that color filter treatment is effective in improving color blindness." They "question the type of evidence which has been accepted as conclusive indication of color vision improvement;" "this proof can be supplied only by measurement of fundamental color vision functions." (Rayleigh equation, etc.) The treatment, they said, is not justifiable since it may lead to the acceptance of responsibilities which the patient cannot fulfill, though he erroneously believes himself cured of color blindness.

Eye Exercises for Myopia,—An important group of patients with myopia and other defects earnestly desire to get rid of their glasses. These patients have been told by ophthalmologists or optometrists that they must wear glasses all the time. They go to a follower of Bates who tells them to discard their glasses, which are crutches. To their surprise they find that nothing serious happens Their sight, of course, is still blurred for distant objects but they find that by practice they acquire the ability to make out objects better through the blur than when they only temporarily took off their glasses during the glasses-wearing period. They are likely to exaggerate this gain in talking about it!

A young man who had been wearing concave lenses asked the writer if there were any way he could pass the test for 20/20 vision. His visual acuity was 20/30 without glasses, 20/15 with his glasses which were concave. To induce relaxation of accommodation, he was given convex lenses. After a few days his vision without glasses was 20/15 and he read 20/15 even with +0.50 sphere. Thus, he was able easily to pass the test for 20/20 vision without glasses. Was his myopia cured? No, because he did not have true myopia to begin with. He had acquired the habit (never mind how) of exerting a small amount of accommodation by which he was able with concave lenses to see extra well. This had become so confirmed a habit that, when the concave lenses were taken off for a few minutes to test him without them, he still exerted unconsciously and automatically this (now unnecessary) accommodation and could see only 20/30 unless the concave (myopic) lenses were given him. This is called pseudo-myopia. Thus what the writer's treatment had done was to teach him to relax his accommodation. He was judged myopic by someone who found that

when —0.50 sphere was placed before his eye he said, "That is better, clearer." If a young man who sees 20/15 sees it better with —0.50 sphere it shows that he has good accommodation, not that he has myopia. Other evidence is necessary before that diagnosis is justified. He should read one or two *more* lines with the minus glass than he reads without.

Cases of true myopia have been reported in which the vision without glasses has been improved by exercises of various sorts, from 20/70 or even less to 20/20. The writer has not had personal experience of such cases.

Orthoptic Exercises,—A well recognized field for treatment by eye exercises is the field of disturbances of motility and binocular vision These are often spoken of as "muscle" troubles. It is true that the movements of the eyes are made by the muscles but it is not true that faults of motility are due to defects of the muscles themselves, except in rare instances. As pointed out above, one is dealing with a *neuro-muscular mechanism for eye movements* and it is the *neuro* part that is usually at fault. In many forms of trouble with eye movements (heterophoria, cross eyes, etc.), much can be accomplished by eye exercises skillfully used by orthoptists.*

A very good example of how exercise, practice, learning, result in ability to see and take in what would be absolutely bewildering to a novice is furnished by an orchestral score. On each page are the notes for all the different instruments of the orchestra being played simultaneously. When a conductor has learned to read such a score, it is not because his vision has improved, but because he has learned how to use it by practice, by exercise.

Many methods of treatment by eye exercises, dispensing with glasses, have been advocated. To describe or even enumerate all is not possible here. The methods advocated by Huxley, Bates, Peppard and others consist in relaxation (passive and dynamic), palming, winking, breathing, sunning; also a group of procedures aimed at increasing mobility, swinging (short and long), flashing, shifting, nose writing.

Extravagant Claims Unjustified,—Since exercises of various sorts have been proven so successful in treating many eye conditions, it was inevitable that some devotees of that kind of treatment should go too far and make exaggerated claims. That always happens. It is the duty of the broadminded, open-minded, well-informed investigator to sift out the good from the bad.

If the results of the various treatments by regular and by irreg-

*The name for this department is orthoptics, and those who practice it are orthoptists. Some of them have achieved brilliant success.

ular practitioners are subjected to the two methods of evaluation mentioned earlier in this article, it is found that in many cases the results measured by scientific methods are sound and good. Other cases show no measurable gain in scientific units such as visual acuity, color vision, motility (cross eyes, etc.), but do show gain when the opinion of the patient himself is asked.

For example, Aldous Huxley has poor vision due to cloudiness of the cornea from old inflammation. Experience with many such cases has demonstrated that this is a condition which has a tendency to show but slight improvement, never resulting in complete cure. Huxley consulted many ophthalmologists with unsatisfactory results. They admitted they could do nothing. After treatment by one of the followers of Bates, Huxley was able to report marked improvement. Judged by the scientific measurement of visual acuity, the Snellen charts, Huxley reads very little more than he did before treatment. Judged by the standard of the patient's own impressions, he *can see better;* at least he can and does use his eyes with much more comfort and does more work with them and is more reconciled to his lot. No impartial judge can deny that this is a worthwhile gain.

It should be distinctly understood, however, that it is not an improvement in the eyes, the ocular part of vision, but in the cerebral, mental part of vision. There has been a tendency to neglect this side of seeing, but as shown in the earlier part of this article, it is a very large and important part, fully 50 per cent. Most of the gains from exercises of various sorts are gains in the sphere of mental or cerebral functioning. This is to be expected, from the nature of the case. Practice alone will not avail much to improve the optical image on the retina, which depends on physical conditions for the most part. But practice, training, exercise will improve the use made of the retinal images by the mind. It is one of the important medical resources.

When untrained and therefore more or less ignorant people attempt to use such resources of treatment it is inevitable that they exaggerate their results, that they fail to put things in proper perspective, and that they embroider their treatment with irrelevant details of no value except as means of impressing the uninformed and aiding in getting the more significant things done. As a result, more or less hocus pocus creeps in. This alienates those who see through these gestures. They are too apt to jettison the whole cargo, the good with the bad.

Are Exercises Harmful?,—The harm that can come from eye exercises is due to the curious weakness of the human intellect which sees the good in something and jumps to the conclusion that

that is the whole story. Just as the followers of Mrs. Eddy, seizing upon the valuable truth that many sicknesses are more mental than physical and can best be cured by treating the mind, jump to the conclusion that all diseases are of that nature and so do great harm to patients with definite physical ailments which can be cured only by physical treatment—for example cancer or glaucoma, so these followers of Bates presume to treat all sorts of eye conditions by taking away glasses and giving exercises usually with a large admixture of mumbo-jumbo quite satisfactory to the ignorant and, therefore, gullible portion of the public. When glaucoma or cancer is treated in this way, of course, irreparable harm is done.

Conclusions.—Seeing is one half physical; it deals with the formation of a good image on the retina and the co-ordination of the two eyes by proper movements of the eyes in fixation and fusion. The other half is mental or psychical and deals with the perception and interpretation of the sensations produced by the images on the two retinas. The first is what goes on in the eyes; the second is what goes on in the brain.

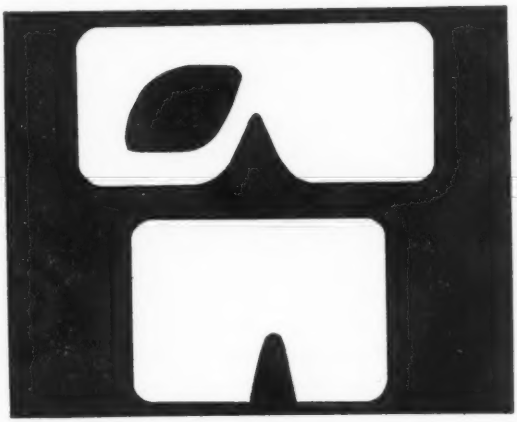
To improve the physical part—the image formation and the fixation and fusion—is the daily task of eye specialists. They do this chiefly by the skillful use of glasses.

To improve the mental or psychic part requires training, teaching, exercises, practice. These are well known to be the indispensable and efficient means by which one learns to see and also learns to do a thousand other things that have to be learned before they can be well done. This side of the problem of seeing has been neglected by ophthalmologists, who were absorbed with other fascinating problems of seeing whose solution is more direct and precise, more mathematical. A natural result is that the problem of the mental, psychical side of seeing has been seized upon frequently by irregular practitioners. Do not infer from this that no ophthalmologist pays attention to the mental side; that would be a gross error. The treatment of psychical difficulties is obviously not at all a clear-cut, mathematical problem. It calls for insight, sympathy, tact, wisdom as distinguished from learning.

To reach the psyche, it has been found by many a clever worker, some of whom are charlatans, that foolish gestures and more or less mumbo-jumbo facilitate putting over the simple underlying principles. When these are stripped of their mummery they do not appeal to the average human intellect, which is incurably superstitious and craves explanations which are not scientific, prefers them, feeds on them. How best to deal with people of that type when they are patients is a far more difficult problem than how to correct

a difficult case of refraction and that, in turn, is more difficult than to perform a cataract operation.

The answers to the questions in the title are now obvious: eye exercises do a great deal of good. They are indispensable in learning to see. They may do harm indirectly if they divert a patient with some disease needing treatment of some special kind so that he is led to follow treatment by exercises instead of consulting a competent ophthalmologist and finding out the true nature of his trouble. The limitations to treatment by eye exercises are also clear. It cannot affect certain physical conditions ("which of you by taking thought can add one cubit to his stature"), but is potent in treating the psychic side of vision. It requires a very high degree of skill and acumen to steer a true course, avoiding the neglect shown by many otherwise competent specialists and avoiding the excesses of over-zealous enthusiasts. Truly, "art is long, life is short, judgment is difficult."



Types of Occluders Used by the United States Navy. The newer form (above) permits observation of squinters and prevents artificial reduction of the size of the pupil by looking along the edge of the opening.

RURAL SCHOOL IMPROVEMENT

PETER STEVENSON, B.S., M.S.P.H.,
AND
ALBERT HEUSTIS, A.B., M.D., M.P.H
Sanitarian and Director
Monroe County (Michigan) Health Department.

Outstanding success has been achieved in securing rural school improvements in Monroe County, Michigan. This was made possible, under wartime conditions, by the cooperative efforts of several community interests, with leadership and stimulation provided by the Health Department.

A full time Health Department was established in April, 1942. It serves an area of 562 square miles which has a population of 62,000. In this jurisdiction are 135 strictly rural one and two-room schools, each with its own local school board.

A survey of these 135 schools was made in September, 1942. This showed that only 44 had approved sewage disposal facilities and only 23 had a safe water supply, as judged by standards of the Michigan Department of Health. One year later 37 of the "bad" schools had built safe privies, and 26 had installed a safe water supply. In the second year of the program, 32 additional schools installed approved privies and 48 more made their wells safe. Thus, in the past two years, 138 approved privies were built at 69 rural schools while in the same period, 74 schools made their water supply safe.

The first phase in this plan of health protection included several planning sessions with the county school commissioner and meetings with the prosecuting attorney. Both were more than interested, and gave the Health Department eager assistance and backing.

The next step was to make a complete survey of existing school conditions. A report on the findings was made to the County Board of Supervisors and to each of the local school boards concerned. A summary was given the newspapers and further public interest was secured by talks to parent-teacher associations, service clubs and interested groups of citizens.

In the spring of 1943, letters were sent to the directors of all "bad" schools stating the defects found and the improvements which were necessary. These reports stated that the Health Department, through its sanitarian, was both willing and eager to help in any problems which might arise. It was further explained that the defects should be corrected before the beginning of the new

school year. During the summer of 1943, 90 different school directors came to the Health Department for assistance and to discuss the recommendations. The most frequent questions were, "Where can I get a pump?" and, "Who can I get to do the work on the privies?"

Community Chest money was used to build the privy riser forms. These were sectional and were transported to and from the jobs by the sanitarian who directed their use. This step resulted in uniformity and correctness of the concrete work.

All hardware dealers and well drillers in the county were contacted and given an explanation as to what constituted a safe or approved water supply as defined by the State Health Department. Their cooperation was requested in providing equipment of the approved type. Two interested carpenters were found by the Health Department, and they provided help with the man-power problem.

"Improvement bees" were planned in several instances where school funds were deficient. Frequently the sanitarian actually helped in mixing concrete or in setting the riser or floor forms. This proved to be a most profitable form of health education, as most of the conversation was on public health. It also established a good working relationship between school officers and the Health Department.

The program was not without opposition and sometimes it was necessary to have an evening meeting with a disgruntled school board. Two such cases are interesting.

The "grape-vine" provided information that one school director had stated that he positively would not make the advised improvements to the wells or privies. A second letter was sent stating that the corrections must be made and a reasonable time limit was set. Copies were sent to the prosecuting attorney and to the township supervisor. When the school official appealed to these men, he was told that the Health Department was right and he was advised to go back home and do the job. He did, and, once it was done, the entire school board was both pleased and proud.

In another area, a meeting of all the school directors was called to "buck" the improvement program. The Health Department heard of this indirectly and attended it in company with the county school commissioner and the prosecuting attorney. Every school in that township now has safe wells and approved privies.

Summary:

Monroe County, Michigan, has 135 strictly rural one and two-room schools, each with its own school board.

A survey, in 1942, showed that only 33% of these schools had safe toilets, while only 17% had a safe water supply as judged by the standards of the Michigan Department of Health.

At the end of 1944, 84% of the County's schools had safe toilets and 72% had safe wells.

This accomplishment was made possible by the combined efforts of the County Health Department, and the county school commissioner, the prosecuting attorney, the Board of Supervisors, local school boards, and the County Community Chest.

* * * * *

Free High Schools?,—Interesting data concerning the necessary expenditures of high school students, above that contributed by taxpayers, was secured by a study conducted in two Cleveland, Ohio, schools. Ralph E. Crow, a member of Cleveland's department of instruction, in writing for *Ohio Schools*, tells how records were kept of 208 students who were in attendance for a full semester and that the results showed education was far from being free.

The items in this study which were included as charges against the cost of attending school were: admission to school activities, laboratory fees, school publications, school supplies, uniforms and equipment, and miscellaneous items. Carfare, lunches and clothing were figured in with these items, and also separately. Hair cuts, razor blades, face powder, tooth paste and the like were all excluded as costs of attending school.

The total semester's expenditure on behalf of the 208 high school students for the items listed was $11,874.48, which averages $57.09 per student. This average becomes $31.89 when clothing is eliminated. If carfares and lunches are eliminated in addition to clothing the average cost per student per semester is $9.92.

Expenditure among individuals varied greatly, according to Mr. Crow. Considering all items, the highest for a single student was $253.86, whereas the lowest was $11.29. It was found that boys spent only $1.04 more than girls spent. But there was a difference noticed depending upon the grade the pupil was enrolled in. As determined by this study, the average costs for 10th, 11th and 12th grades respectively were $45.88, $55.92 and $75.25.

The extremes of expenditures discovered by this study points to the marked inequalities in spending power existing among pupils. Some have only enough and others have more than enough to secure the school publications, purchase school supplies, pay laboratories fees, attend school functions and buy warm lunches. Mr. Crow believes plans ought to be made which would permit all students to be financially able to engage in all basic school activities, to secure all essential school supplies and equipment, to dress appropriately, and to obtain nourishing lunches. From School Management, March 1945, p. 247.

A PROGRAM FOR EDUCATING HANDICAPPED CHILDREN

OREGON STATE DEPARTMENT OF EDUCATION

During the first year of the operation of the program for the education of handicapped children, 1610 children were certified by the State Department of Education and instructed in the various schools of the state. This exceeded by several hundred the number that had been previously estimated. It falls far short, however, of the approximately 4,000 children discovered in the survey two years ago.

In addition to those certified, several hundred other children were given examinations and incidental services. The obvious conclusion to be drawn from these facts is that in spite of a most satisfactory first year there is still much to be accomplished in the future. Probably the next strongest feature of the program is that of teacher education. This work includes both extension classes, carried on through cooperation with the State System of Higher Education and extensive inservice training. Through the former more than 200 teachers took credit courses in the Portland Summer Sessions. The latter aspect of the program reached 1200 teachers in instruction periods ranging from one to ten hours.

The staff of the Division of Special Education of the State Department of Education consists of six persons: Dr. V. D. Bain, Director; Dr. Leon Lassers, Supervisor in the Field of Vision and Consultant for the state Child Guidance Clinic of the University of Oregon Medical School; Mrs. Ethel N. Fortner, Supervisor in the Field of Vision and Consultant for the Oregon State School for the Blind; Mr. John Taylor, Supervisor in the Field of Hearing and Consultant for the Oregon State School for the Deaf; Miss Pearl Bendiksen, Secretary, and Mrs. Gertrude Hamrick, Fiscal Worker.

On the basis of the first year's experience, plans have been made for extending and improving most aspects of the services in spite of the shortage in the supply of certain types of specially-trained personnel. These plans may be briefly summarized as follows:

1. Inservice education and consultation clinic on a county-wide basis.

2. Special summer instruction for hard-of-hearing children, difficult speech cases, and extreme learning problems in reading, utilizing the facilities of the State School for the Deaf

3. Consultation with school districts desiring assistance on the request of such districts.

4. Inservice teacher education for school staffs upon invitation of the school authorities.

5. Continued special work with speech problems by Doctor Lassers in the State Child Clinic Centers.

6. Continuation of the plan of furnishing sight-conservation material and services between the State School for the Blind and the schools of the state by Mrs. Fortner.

7. Continuation of liaison service between the State School for the Deaf and the schools of the state by Mr. Taylor.

8. Preparation and distribution of information pertaining to various aspects of the program.

9. Continued support of the educational program in the Doernbecher, Shriner, and Tuberculosis Hospitals.

10. Continued reimbursement of school districts as provided by law to the extent of available funds.

These county-wide programs are part of a general supervisory scheme requested by the county school superintendents and other administrators. They consist of the following features:

1. All elementary teachers of a county attend an instructional conference (this year ranging from one-half to two days) at which through demonstrations and lectures various aspects of the program for the education of handicapped children and for the prevention of handicapped conditions are presented by the staff members of the Division of Special Education.

2. Children having handicapped conditions in vision, hearing, and speech are selected by school and health staffs working together. These children are then brought to consultation clinics in strategic centers throughout the county where they are seen by the special supervisors and recommendations are made concerning them.

Plans have been made for carrying on this program during the present school year in the following counties: Lincoln, Morrow, Crook, Deschutes, Lake, Harney, Washington, Polk, Columbia, and Gilliam.

This plan will be continued next year and counties will be served in the order that requests for the services are received.

Plans are already carefully made to utilize the State School for the Deaf during eight weeks of next summer when the school is not being used by deaf children for instruction of difficult cases from all parts of the state. The work would be carried out with (a) hard-of-hearing children who need lip-reading instruction, (b) children having severe speech difficulties, and (c) children who have extreme reading difficulties.

Superintendent Clatterbuck and certain members of his staff would maintain the operation of the dormitories and other physical facilities, and the State Department of Education through its Di-

vision of Special Education would furnish the educational specialists and expert teachers.

The plan would be wholly for the instruction of handicapped children. First choice of the children to be admitted would be made from those school districts not now employing special teachers. Through the county clinics described above these children can be reached for educational diagnosis, but if their problems are so extreme that the regular classroom teachers cannot solve them with the advice of the supervisors they cannot receive the needed special instruction except through this plan or the much more expensive and less satisfactory plan of sending them away from home to some other school district during the school year.

These children will be selected during the school year by the supervisors on the basis of requests from school districts, health departments, and parents. Under the terms of the law, children who are low in mental ability cannot be selected. It is planned, at least for the first year, to restrict the selection to children of the approximate ages for the grade levels 3 to 8, that is 8 to 14 years old. The maximum number of children that can be accommodated at the summer school is 120.

The living expenses which under present price levels would amount to about $8.00 per week would be borne by the parents or some other agency or local organization. The educational expenses would be paid from the handicapped children's fund.

There are many advantages in a plan of this kind; some of the more obvious of which are indicated below:

1. It would give concentrated expert instruction to children who could not otherwise obtain it.

2. Educationally the plan is almost ideal as the environment of the children can be controlled and their entire energies can be given to the one task of overcoming their handicaps.

It is not only sound educationally, but because it utilizes state facilities that would otherwise be idle and personnel already on the state payroll, it would be extremely economical. The educational cost for individual instruction by specially trained teachers under the supervision of experts would not exceed $8.00 per week per child.

To the extent that their schedules will permit, the supervisors will respond to special invitations by school districts for consultation with teacher groups or concerning the cases of individual children. These requests will be met in the order of their receipt. A more detailed description of the consultation service and liaison activities referred to above are found in the January, 1944, issue of *Education News*.

Some of the materials pertaining to various aspects of the program available for distribution are listed below:

1. *What the Classroom Teacher Can Do for the Handicapped Child.*

Mimeographed bulletin. Contains brief sections on vision and hearing problems and a simple but detailed discussion of what the classroom teacher can do for the child who is having speech difficulty.

2. *Save Your Eyes.*

A list of books written in suitable type for visually-handicapped children.

When a school district spends more than its regular per capita cost on instruction of a handicapped child, it is entitled to enter a claim for reimbursement from the state fund for the excess cost up to an amount equal to one and one-half times the regular per capita cost of the district. It will be necessary, however, to discount claims for the school years of 1944-45 and 1945-46 because the appropriation made by the legislature is insufficient to pay all claims in full. The per cent of discount, which will be made on a pro rated basis, cannot be determined until all claims have been submitted and approved. — Reprinted from the *Oregon Outlook*, Sept.-Oct., 1944.

* * * * *

The Control of Communicable Diseases*,—The publication of "The Control of Communicable Diseases," an official report of the American Public Health Association, 6th edition, is announced by the Association.

First published in 1916, the successive editions of these standard recommendations for the administrative control of the communicable diseases have had world-wide circulation. The present report is official with the United States Public Health Service, the United States Navy, and has been approved in principle by the Surgeon General of the United States Army. It has been recommended for adoption as an official statement by the National Health Administration of China. Many of its sections were prepared in agreement with representatives of the Medical Staff of the British Ministry of Health. This volume is being translated into Spanish, Portuguese, French, Italian, Chinese and, possibly, Arabic.

*The book may be secured from the Book Service, American Public Health Association, 1790 Broadway, New York 19, N. Y. It contains 146 pages and sells for 35c per copy and in quantity as follows: 1 to 24 copies—35c each; 25 to 99 copies—30c each; 100 to 499 copies—28c each; 500 up—20c each.

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EDITORIAL

This issue of the Journal contains two articles relating to eyes, eye testing and eye hygiene.

Within the last several months several articles have appeared that indicate two things at least:

1. A considerable dissatisfaction with the results (accuracy) of testing the vision of school children by means of the Snellen chart only, even though it be used merely as a screening test, the feeling being that with its use many cases that should have more thorough study and possibly lenses are missed—not reported as cases needing further attention.

Using the Snellen test alone, numerous reports, over a long period of years, have seemed to show that 16% more or less of school children showed faulty vision.

A few years ago an analysis of tests made with the Betts test showed an enormous percentage of defective vision cases (82.6%).[1] These results were discussed unfavorably in the Journal of the American Medical Association.[2] Says the AMA Journal: "It seems obvious that any test (Betts test under discussion) which finds 82% of school children with defective vision is too discriminating and defeats its own purpose"[2] . . . "The tabulated results warrant the conclusion that the tests in present use are either inadequate or overzealous and that a further development of standard visual efficiency tests to be used in the nation's schools should be made."[2] Although not a statistician, such a percentage of de-

1. Archives of Othalmology, August 1940, p. 221.

2. Journal of the American Medical Association, September 28, 1940, p. 1132, and The Journal of School Health, November, 1940, p. 276.

fective vision cases indicates, to us at least, that the standard of normality set is at fault—is too high.

A short while ago a report appeared concerning the procedures involved in the Massachusetts Vision Test.[3] Using this test, about 32% of those children examined show deviations from the assumed normal. The test not only screens out the myopias, etc., found by the Snellen test, but also the latent hypermetropia and the muscle imbalance cases.

While figures are not available that would make possible a comparison between the status of acuity of vision among children forty years ago and the present status, to an observer who has had intimate contact with school children and with examination of these children during most of those years, there seems an enormous increase in the proportion of our young people who wear glasses. How much of this increase is due to more widespread and better eye examinations, how much is due to more widespread and more energetic optical services and salesmanship, and how much is due to diminution of visual acuity of today's children compared to those of two generations ago is unknown.

To be sure a new factor has appeared in the picture: modern life, school work, and industry need better vision and demand greater, more prolonged and more intensive use of eyes than the situations of forty years ago demanded.

* * * * * *

The other article deals with a controversial subject. Are "eye exercises" just a waste of time and energy, are they detrimental, or are they a benefit to the user? From various more or less well informed persons we get an affirmative answer to each of these three questions, some of the answers presenting considerable heat, some read like planned propaganda, some are judicious.[4] Probably, any beneficial results must rest on the same foundation as any other therapy must rest—on accurate diagnosis and on proper selection of cases.—C. H. K.

3. See Journal of School Health, Jan. 1944, p. 6.
4. Journal A. M. A. Nov. 18, 1944, p. 771.